

Integrated AC LED Solution

**Acrich2 – 30W**

SMJQ-133NFNSA



## Product Brief

### Description

- The Acrich2 series of products are designed to be driven directly off of AC line voltage, therefore they do not need the standard converter essential for conventional general lighting products.
- The converter or driver found in most general lighting products can limit the overall life of the product, but with the Acrich2 series of products the life of the product can more closely be estimated from the LED itself. This will also allow for a much smaller form factor from an overall fixture design allowing for higher creativity in the fixture.
- The modules have a high power factor which can contribute to a higher energy savings in the end application.

### Features and Benefits

- Connects directly to AC line voltage
- High Power Factor
- Low THD
- Long Life Time
- Simple BOM
- Lead Free Product
- RoHS Compliant
- High Efficacy
- **It will be applied IC (3.0 ver) soon.**

### Key Applications

- Street Light / Road-way
- High-bay / Low-bay
- Tunnel Light

**Table 1. Product Selection**

Part No.	Vin [Vac]	P [W]	CCT [K]	Flux [lm]		CRI
				Min.	Typ.	Min.
SMJQ-133NFNSA	220	30	4700-5300	2900	3100	70

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## Performance Characteristics

**Table 2. Electro Optical Characteristics, Stabilized at T<sub>a</sub>=25°C**

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux	$\Phi_V$ [2]	2900	3100	-	lm	2V, 3V
Correlated Color Temperature [3]	CCT	4700	5000	5300	K	
CRI	Ra	70	-	-	-	
Input Voltage [4]	$V_{in}$	120			Vac	2V
		220				3V
Power Consumption	P	27	30	33	W	30W
Operating Frequency	f	50 / 60			Hz	
Power Factor	PF	Over 0.97			-	
Viewing Angle	$2\Theta_{1/2}$	120			deg.	
Tolerance of Surge [5]	Vs	500			V	
Transient Protection [6]	Vs	2500			V	

**Notes :**

- (1) Test voltage is 120Vac and 220Vac at T<sub>a</sub> = 25°C.
- (2)  $\Phi_V$  is the total luminous flux output measured with an integrated sphere.
- (3) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
- (4) Operating Voltage doesn't indicate the maximum voltage which customers use but means tolerable voltage according to each country's voltage variation rate. It is recommended that the solder pad temperature should be below 70 °C.
- (5) Surge withstand in accordance with IEC61000-4-5
- (6) At 120Vac, seven strikes, 100kHz 2.5kV in accordance with ANSI/IEEE C62.41.2-2002 Category A operation

## Absolute Maximum Ratings

**Table 3. Absolute Maximum Ratings,  $T_a = 25^\circ\text{C}$ , 220Vac**

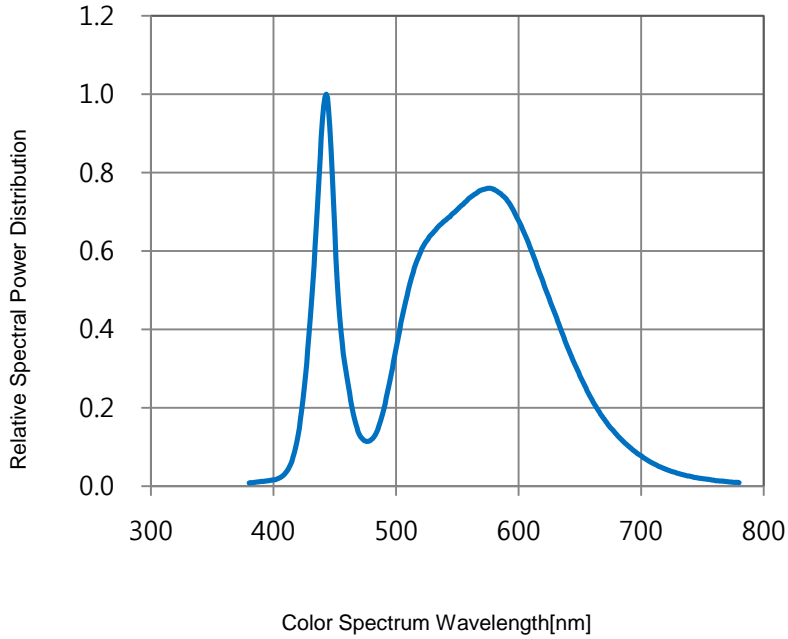
Parameter	Symbol	Unit	Value
Maximum Input Voltage <sup>1)</sup>	$V_{in}$	Vac	264 at 220Vac
			144 at 120Vac
Power Consumption	P	W	37
Operating Temperature	$T_{opr}$	$^\circ\text{C}$	- 20 ~ 60
Storage Temperature <sup>2)</sup>	$T_{stg}$	$^\circ\text{C}$	- 40 ~ 100
ESD Sensitivity	-	-	$\pm 4,000\text{V HBM}$

**Notes :**

- (1) Maximum Voltage doesn't indicate the operating voltage which customers use but means tolerable voltage according to each country's voltage variation rate.
- (2) Ambient temperature without operation.

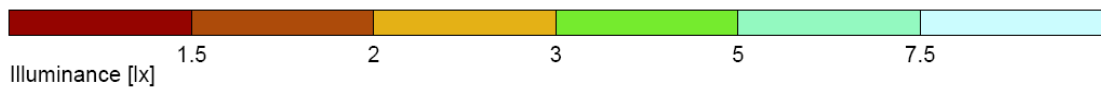
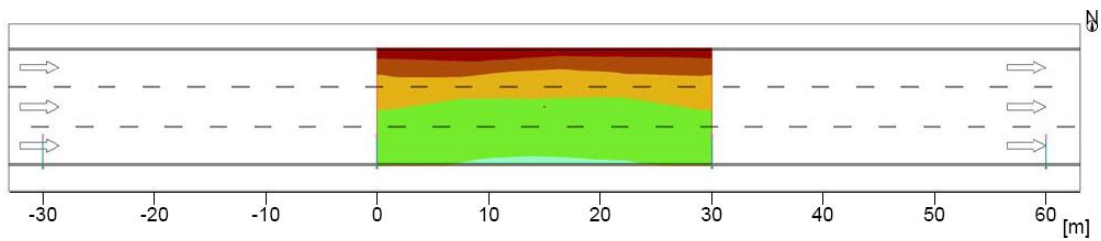
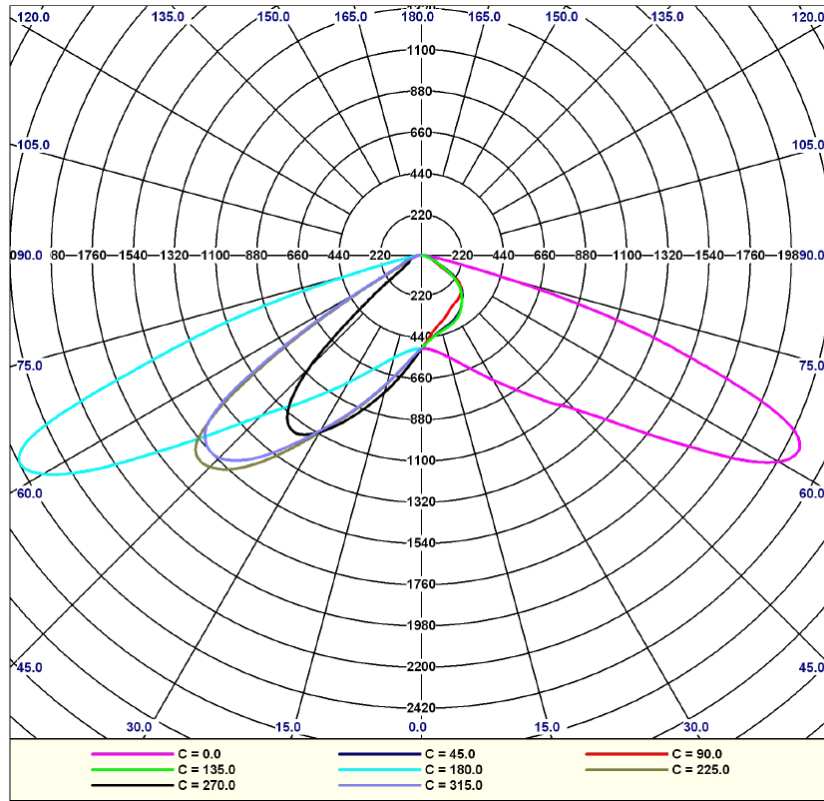
## Relative Spectral Distribution

Fig 1. Relative Spectral Distribution vs. Wavelength Characteristic – C



## Performance Characteristics

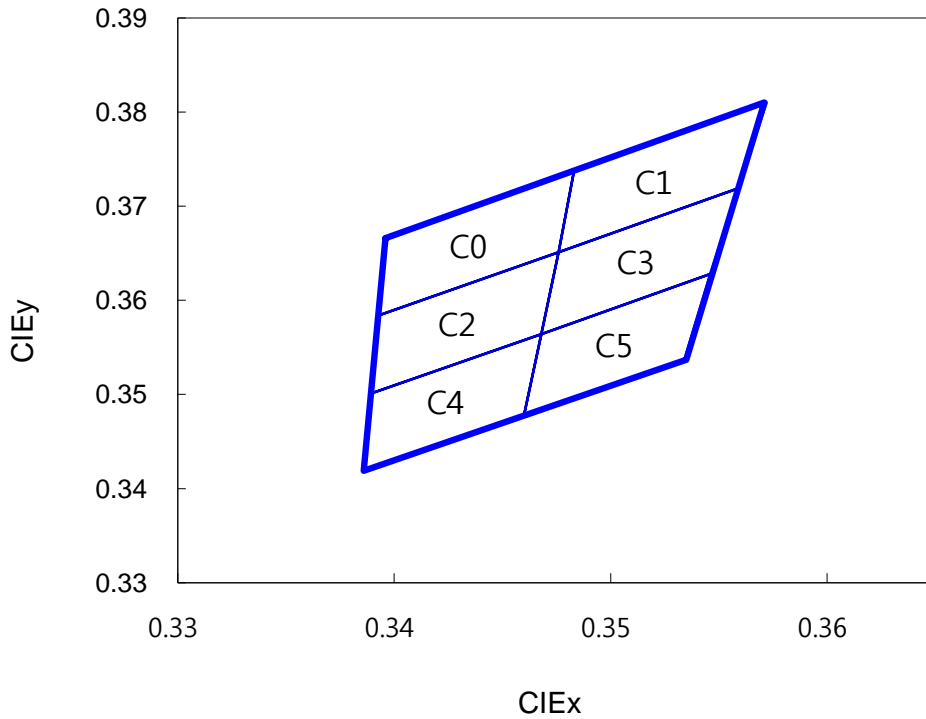
Fig 2. Light Distribution Profile,  $T_a = 25^\circ\text{C}$



### Notes :

- (1) It is TYPE II Light Distribution Profile
- (2) Illuminance Uniformity  $U_0$  ( $E_{min}/E_m$ ) is 0.42 which was calculated at the luminaire height of 12m and the luminaire power is 120W

## Color Bin Structure



Bin	x	y	Bin	x	y	Bin	x	y
<b>C0</b>	0.3376	0.3616	<b>C2</b>	0.3373	0.3534	<b>C4</b>	0.3369	0.3451
	0.3373	0.3534		0.3369	0.3451		0.3366	0.3369
	0.3456	0.3601		0.3448	0.3514		0.3440	0.3428
	0.3463	0.3687		0.3456	0.3601		0.3448	0.3514
<b>C1</b>	0.3463	0.3687	<b>C3</b>	0.3456	0.3601	<b>C5</b>	0.3448	0.3514
	0.3456	0.3601		0.3448	0.3514		0.3440	0.3428
	0.3539	0.3669		0.3526	0.3578		0.3514	0.3487
	0.3552	0.3760		0.3539	0.3669		0.3526	0.3578

## Part List

**Table 4. Part List**

No	Part	Specification	Quantity
1	Group Lens Cover	<ul style="list-style-type: none"> <li>Material : Polycarbonate</li> <li>Thickness : 2.0mm</li> </ul>	1
2	Lens Screw	<ul style="list-style-type: none"> <li>Material : Stainless Steel</li> <li>Type : M3</li> </ul>	8
3	Sealing Rubber	<ul style="list-style-type: none"> <li>Material : Molded Silicone</li> </ul>	1
4	LED module	<ul style="list-style-type: none"> <li>LED PKG : MJT5050</li> <li>PCB : Aluminum Metal PCB 1.6T</li> <li>On-board Surge Protection Circuit</li> </ul>	1
5	Module Screw	<ul style="list-style-type: none"> <li>Material : Stainless Steel</li> <li>Type : M2</li> </ul>	2
6	Heat sink	<ul style="list-style-type: none"> <li>Material : Die-cast Aluminum</li> <li>Color : Pantone Black</li> <li>Thermal Grease between the PCB and Heat sink</li> </ul>	1
7	PG-7	<ul style="list-style-type: none"> <li>Water Proof Connector : Type PG-7</li> <li>Material : Polycarbonate</li> </ul>	1
8	Wire Harness	<ul style="list-style-type: none"> <li>Water Proof Wire Harness</li> <li>Easy to connect</li> </ul>	1
9	Thermal Grease	<ul style="list-style-type: none"> <li>Color : White</li> </ul>	-

**Notes :**

- (1) The above specification is subject to change without further notice for the improvement of products.



## Feature and Mechanical Dimensions



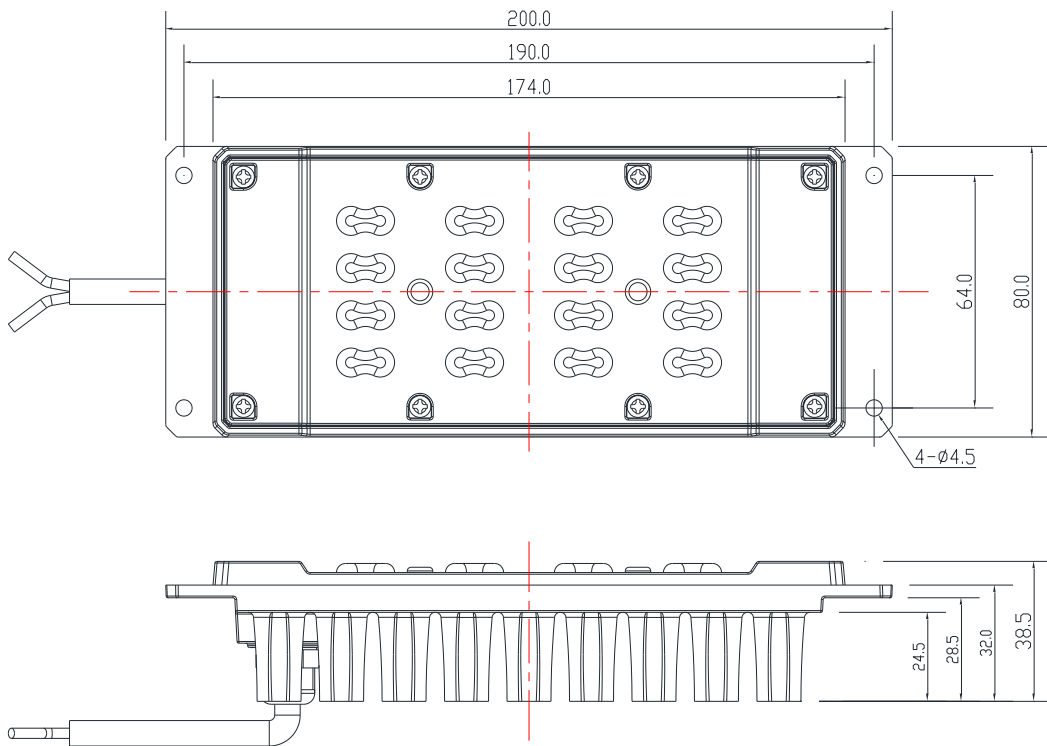
<Front View>



<Right-side View>



<Side View>



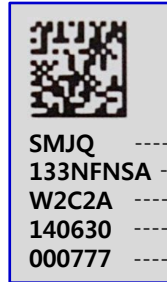
**Notes :**

- (1) All dimensions are in millimeters. (Tolerance unless noted :  $\pm 0.2$ )
- (2) Scale : None

## Marking Information


**Marking Points**

- Label specification
- resolution : 300dpi
- QR code Cell size : > 0.25mm



**Table 5. QR code details**

No	Data	Digit	Example	Remark
1	Product Name-1	4	SMJQ	SSC internal code
2	Product Name-2	4	133NFNSA	Refer to the table 6
2	PKG rank	4	W2C2A	
3	Produce date (YYMMDD)	6	140630	2014 / 06 / 30
5	Serial number	5	000001 ~ 999999	Product Number of Produced

**Table 6. Product Nomenclature**



소비 전력		입력 전압		색온도		지향각		Dimming		Base		일련 번호		
5	6	7		8		9		10		11		12		
0~9W	0	0~9W	1~	Free Voltage	0	Warm White	L	0°~19°	A	Non	N	B22	A	0~9 or A~Z
10W~99W	1~	10W~99W	0~	100 Vac	1	Neutral White	N	20°~39°	B	Dimming	D	E5	B	
100W	A	0~9W	0	120 Vac	2	Cool White	D	40°~59°	C	기타	E	E10	C	
		10W~19W	1	220 Vac	3	Red	R	60°~89°	D			E11	D	
		20W~29W	2	ACDC 12V	4	Green	G	90°~139°	E			E12	E	
		30W~39W	3	24V	5	Blue	B	140°~200°	F			E14	F	
		40W~49W	4	기타	6	R+G+B	F	201° 이상	G			E17	G	
		50W~59W	5			Amber	A	Type I	H			E26, E27	H	
		60W~69W	6			기타	E	Type II	J			E39	J	
		70W~79W	7					Type III	K			E40	K	
80W~89W	8					Type IV	L			GU5.3	L			
90W~99W	9					Type V	M			G7	M			

## Label Information

<b>Model No.</b>	<b>SMJQ-133NFNSA<sup>(1)</sup></b>
<b>Rank</b>	<b>W2C2A<sup>(2)</sup></b>
<b>Type</b>	
<b>Quantity</b>	<b>XX</b>
<b>Date</b>	<b>YYYY.MM.DD</b>
	<b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes**

- (1) The model number designation is explained as follow
- (2) It represents the LED module rank that consists of three characters.
- (3) It is attached to the top left corner of the box.

<b>TOTAL Quantity</b>  <b>XX</b>
 <b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes**

- (1) It is attached to the bottom right corner of the box.

## Handling of Silicone Resin for LEDs

- (1) Acrich2 series is encapsulated with silicone resin for high optical efficiency.
- (2) Please do not touch the silicone resin area with sharp objects such as pincette(tweezers).
- (3) Finger prints on silicone resin area may affect the performance.
- (4) Please store LEDs in covered containers to prevent dust accumulation as this may affect performance.
- (5) Excessive force more than 3000gf to the silicone lens can result in fatal or permanent damage with LEDs.
- (6) Please do not cover the silicone resin area with any other resins such as epoxy, urethane, etc.

## Handling with regards to static electricity

- (1) The Acrich2 products use an integrated circuit (IC) which can be damaged when exposed to static electricity. Please handle using equipment that prevents static electricity. Do not touch unless ESD protection is used.
- (2) The Acrich2 product should also not be installed in end equipment without ESD protection.

## Storage before use

- (1) Do not impact or place pressure on this product because even a small amount of pressure can damage the product. The product should also not be placed in high temperatures, high humidity or direct sunlight since the device is sensitive to these conditions.
- (2) When storing devices for a long period of time before usage, please following these guidelines:
  - \* The devices should be stored in the anti-static bag that it was shipped in from Seoul-Semiconductor with opening.
  - \* If the anti-static bag has been opened, re-seal preventing air and moisture from being present in the bag.

## **Guidelines for properly working with Acrich2**

- (1) Discharge the lighting system a minimum of 2-3 times prior to working with the module.
- (2) Use only properly rated test equipment and tools for the rated voltage and current of the product being tested.
- (3) It is strongly suggested to wear rubber insulated gloves and rubber bottom shoes.
- (4) Do not wear any conductive items (such as jewelry) which could accidentally contact electric circuits.
- (5) Perform several tests with power off and the lighting system unplugged.
- (6) Faults, lightning, or switching transients can cause voltage surges in excess of the normal ratings.
- (7) Internal component failure can cause excessive voltages.
- (8) Stored or residual electricity in long wire could be hazardous.
- (9) Make sure proper discharge prior to starting work.

## Precaution for Use

- (1) Please review the Acrich2 Application Note for proper protective circuitry usage.
- (2) Please note, Acrich2 products run off of high voltage, therefore caution should be taken when working near Acrich2 products.
- (3) DO NOT touch any of the circuit board, components or terminals with body or metal while circuit is active.
- (4) Please do not add or change wires while Acrich2 circuit is active.
- (5) Long time exposure to sunlight or UV can cause the lens to discolor.
- (6) Please do not use adhesives to attach the LED that outgas organic vapor.
- (7) Please do not use together with the materials containing Sulfur.
- (8) Please do not assemble in conditions of high moisture and/or oxidizing gas such as Cl, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>, etc.
- (9) Please do not make any modification on module.
- (10) Please be cautious when soldering to board so as not to create a short between different trace patterns.

## Precaution for Use

(11) LEDs are sensitive to Electro-Static Discharge (ESD) and Electrical Over Stress (EOS).

Below is a list of suggestions that Seoul Semiconductor purposes to minimize these effects.

a. ESD (Electro Static Discharge)

Electrostatic discharge (ESD) is defined as the release of static electricity when two objects come into contact. While most ESD events are considered harmless, it can be an expensive problem in many industrial environments during production and storage. The damage from ESD to an LEDs may cause the product to demonstrate unusual characteristics such as:

- Increase in reverse leakage current lowered turn-on voltage
- Abnormal emissions from the LED at low current

The following recommendations are suggested to help minimize the potential for an ESD event:

One or more recommended work area suggestions:

- Ionizing fan setup
- ESD table/shelf mat made of conductive materials
- ESD safe storage containers

One or more personnel suggestion options:

- Antistatic wrist-strap
- Antistatic material shoes
- Antistatic clothes

Environmental controls

- Humidity control (ESD gets worse in a dry environment)

b. EOS (Electrical Over Stress)

Electrical Over-Stress (EOS) is defined as damage that may occur when an electronic device is subjected to a current or voltage that is beyond the maximum specification limits of the device.

The effects from an EOS event can be noticed through product performance like:

Changes to the performance of the LED package (If the damage is around the bond pad area and since the package is completely encapsulated the package may turn on but flicker show severe performance degradation.)

Changes to the light output of the luminaire from component failure

Components on the board not operating at determined drive power

Failure of performance from entire fixture due to changes in circuit voltage and current across total circuit causing trickle down failures

It is impossible to predict the failure mode of every LED exposed to electrical overstress as the failure modes have been investigated to vary, but there are some common signs that will indicate an EOS event has occurred.

- Damaged may be noticed to the bond wires (appearing similar to a blown fuse).
- Damage to the bond pads located on the emission surface of the LED package (shadowing can be noticed around the bond pads while viewing through a microscope).
- Anomalies noticed in the encapsulation and phosphor around the bond wires.
- This damage usually appears due to the thermal stress produced during the EOS event.

c. To help minimize the damage from an EOS event Seoul Semiconductor recommends utilizing

- A surge protection circuit
- An appropriately rated over voltage protection device
- A current limiting device





## Company Information

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### Company Information

Seoul Semiconductor ([www.SeoulSemicon.com](http://www.SeoulSemicon.com)) manufactures and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, Home appliance, signage and back lighting markets. The company is the world's fifth largest LED supplier, holding more than 10,000 patents globally, while offering a wide range of LED technology and production capacity in areas such as "nPola", "Acrich", the world's first commercially produced AC LED, and "Acrich MJT - Multi-Junction Technology" a proprietary family of high-voltage LEDs.

The company's broad product portfolio includes a wide array of package and device choices such as Acrich and Acirch2, high-brightness LEDs, mid-power LEDs, side-view LEDs, and through-hole type LEDs as well as custom modules, displays, and sensors.

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